# 3.7 NOISE

## 3.7.1 INTRODUCTION

This section describes the proposed program's impacts on noise levels and sensitive receptors. Specifically, it describes the existing noise conditions in the Phase 1 SERP coverage area, discusses relevant laws and policies, and identifies the significant impacts that may result from the program, as well as mitigation measures to avoid or reduce those impacts.

## 3.7.2 REGULATORY SETTING

### FEDERAL PLANS, POLICIES, REGULATIONS, AND LAWS

To address the human response to groundborne vibration, the Federal Transit Administration (FTA) has established guidelines for maximum acceptable vibration criteria for different types of land uses. These guidelines recommend 65 vibration decibels (VdB) referenced to 1 microinch per second (µin/sec) and based on the root mean squared (RMS) velocity amplitude for land uses where low ambient vibration is essential for interior operations (e.g., hospitals, high-tech manufacturing, laboratory facilities); 80 VdB for residential uses and buildings where people normally sleep; and 83 VdB for institutional land uses with primarily daytime operations (e.g., schools, churches, clinics, offices) (FTA 2006:8-3).

### STATE PLANS, POLICIES, REGULATIONS, AND LAWS

The *State of California General Plan Guidelines 2003*, published by the California Governor's Office of Planning and Research (OPR), provides guidance for the acceptability of certain types of development within areas of specific noise exposure. Table 3.7-1 presents acceptable and unacceptable community noise exposure limits for various land use categories (OPR 2003:244–254). The guidelines also present adjustment factors that may be used to arrive at noise acceptability standards that reflect the noise control goals of the community, the particular community's sensitivity to noise, and the community's assessment of the relative importance of noise pollution.

### REGIONAL AND LOCAL PLANS, POLICIES, REGULATIONS, AND ORDINANCES

#### Overview

The Phase 1 SERP coverage area includes six counties (i.e., Sacramento, Yolo, Solano, Sutter, Colusa, and Butte). Each county has its own general plan policies and local ordinances. Within the counties, local municipalities also influence various aspects of land use through their own general plans and local codes.

Some counties located within the Phase 1 SERP coverage area have adopted construction noise exemptions, performance standards, and land use compatibility guidelines. Butte and

**Table 3.7-1**
**OPR Guidelines for Land Use Noise Compatibility**

| Land Use Category | Community Noise Exposure ($L_{dn}$ or CNEL, dB) | | | |
|---|---|---|---|---|
| | Normally Acceptable[1] | Conditionally Acceptable[2] | Normally Unacceptable[3] | Clearly Unacceptable[4] |
| Residential—low density single family, duplex, mobile home | <60 | 55–70 | 70–75 | 75+ |
| Residential—multiple family | <65 | 60–70 | 70–75 | 75+ |
| Transient lodging, motel, hotel | <65 | 60–70 | 70–80 | 80+ |
| School, library, church, hospital, nursing home | <70 | 60–70 | 70–80 | 80+ |
| Auditorium, concert hall, amphitheater | | <70 | 65+ | |
| Sports arenas, outdoor spectator sports | | <75 | 70+ | |
| Playground, neighborhood park | <70 | | 67.5–75 | 72.5+ |
| Golf courses, stable, water recreation, cemetery | <75 | | 70–80 | 80+ |
| Office building, business commercial and professional | <70 | 67.5–77.5 | 75+ | |
| Industrial, manufacturing, utilities, agriculture | <75 | 70–80 | 75+ | |

Notes:
CNEL = community noise equivalent level; dB = A-weighted decibels; $L_{dn}$ = day-night average noise level.
1 Specified land use is satisfactory, based on the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.
2 New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features are included in the design. Conventional construction, but with closed windows and fresh-air supply systems or air conditioning, will normally suffice.
3 New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design. Outdoor areas must be shielded.
4 New construction or development should generally not be undertaken.
Source: OPR 2003:244–254

Sacramento counties exempt construction noise during daytime hours. Sutter and Solano counties apply performance standards when evaluating construction noise ranging from 45 dB (nighttime) to 55 dB energy-equivalent noise level ($L_{eq}$) (daytime) at the property lines of noise-sensitive land uses. The general plans of Colusa and Yolo counties contain noise policies only to guide development.

**Degradation of the Ambient Community Noise Environment**

In community noise assessments, increases in community noise levels associated with implementation of a project are "generally not significant" if no noise-sensitive sites are located within the plan area or if the noise levels related to a project would not exceed +3 dB at noise-sensitive locations near the project (Caltrans 1998:40–43). Using a single value to evaluate an impact relating to a noise level increase does not account for the preexisting ambient noise environment to which people have become accustomed. Studies assessing the percentage of people who are highly annoyed by changes in ambient noise levels indicate that when ambient noise levels are low, a greater change is needed to cause a response. As ambient noise levels increase, less change in noise levels is required to elicit significant annoyance.

## 3.7.3 ENVIRONMENTAL SETTING

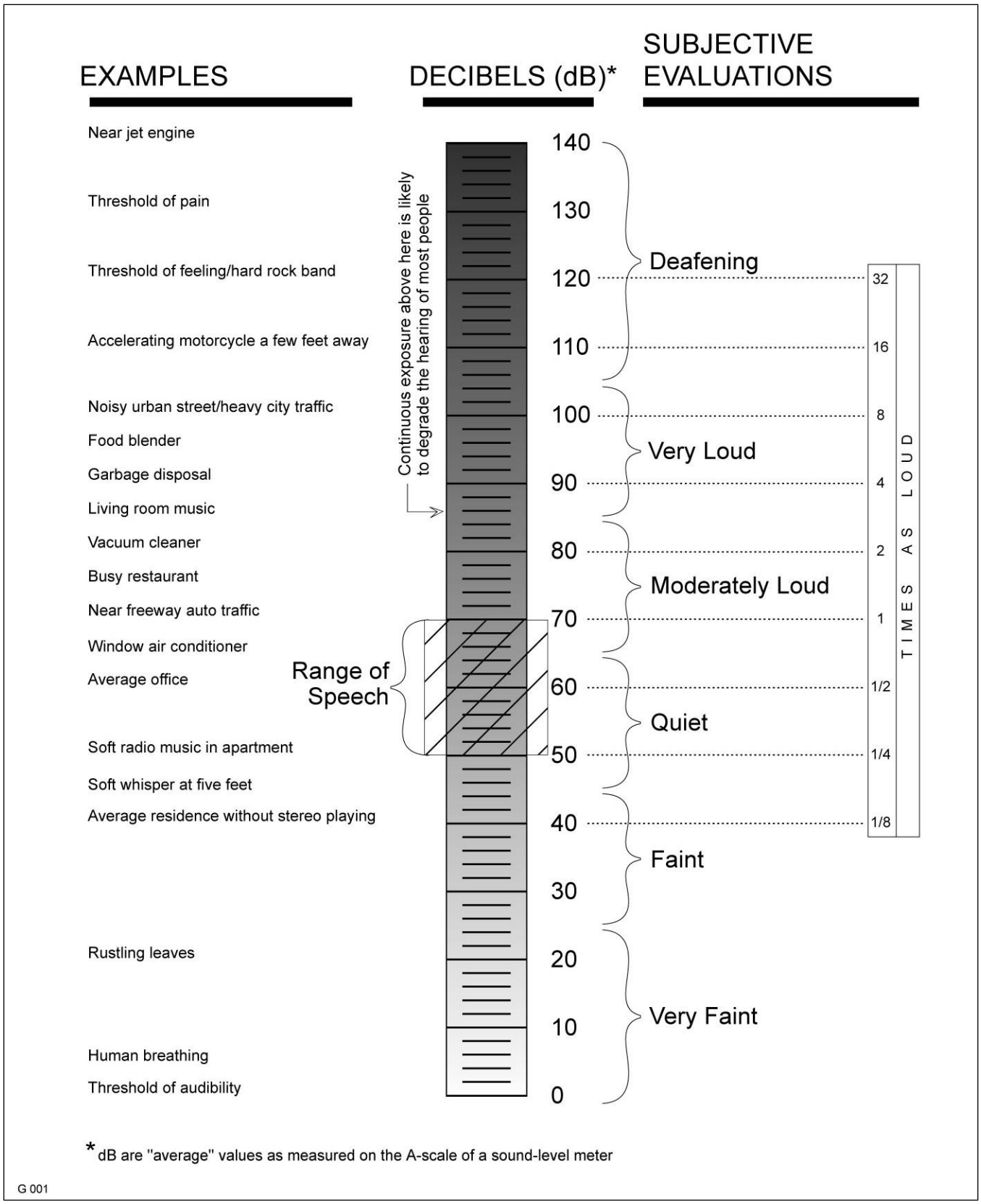
### FUNDAMENTALS OF SOUND

Sound is a mechanical form of radiant energy, transmitted by a pressure wave through a solid, liquid, or gaseous medium. Sound that is loud, disagreeable, unexpected, or unwanted is generally defined as noise; consequently, the perception of sound is subjective in nature and can vary substantially from person to person. Common environmental noise sources and noise levels are presented in Exhibit 3.7-1.

The loudness of sound preserved by the human ear depends primarily on the overall sound pressure level and frequency content of the sound source. The human ear is not equally sensitive to loudness at all frequencies in the audible spectrum. To better relate overall sound levels and loudness to human perception, frequency-dependent weighting networks were developed. The standard weighting networks are identified as A through E. A strong correlation exists between the way humans perceive sound and A-weighted sound levels (dBA). For this reason, dBA can be used to predict community response to environmental and transportation noise. Sound levels expressed as dB in this section are A-weighted sound levels, unless noted otherwise.

As sound travels over distance, noise levels attenuate (reduce) dependent on ground absorption characteristics, atmospheric conditions, and the presence of physical barriers (walls, building façades, berms). Noise generated from mobile sources (e.g., automobiles, trucks, and airplanes) generally attenuates at a rate of 4.5 dB per doubling of distance. Stationary noise sources (e.g., construction sites and fixed machinery) spread with more spherical dispersion patterns, which attenuate at a rate of 6 dB to 7.5 dB per doubling of distance.

Atmospheric conditions such as wind speed, turbulence, temperature gradients, and humidity may additionally alter the propagation of noise and affect noise levels at a receptor.




Source: Created by AECOM in 2008

**Exhibit 3.7-1** **Typical Noise Levels**

Furthermore, the presence of a large object (barrier) between the source and the receptor can provide substantial attenuation of noise levels at the receptor.

### NOISE DESCRIPTORS

The intensity of environmental noise changes over time. This section provides several different descriptors of time-averaged noise levels. The selection of a proper noise descriptor for a specific source depends on the spatial and temporal distribution, duration, and fluctuation of both the noise source and the environment. The noise descriptors most often used to describe environmental noise are defined below:

- $L_{max}$ (Maximum Noise Level): The highest A/B/C-weighted, integrated noise level during a specific period of time.
- $L_{min}$ (Minimum Noise Level): The lowest A/B/C-weighted, integrated noise level during a specific period of time.
- $L_n$ (Statistical Descriptor): The noise level exceeded n% of a specific period of time, generally accepted as an hourly statistic. An $L_{10}$ would be the noise level exceeded 10% of the measurement period.
- $L_{eq}$ (Energy-Equivalent Noise Level): The energy mean (average) noise level and the steady-state sound level in a specified period of time that contains the same acoustical energy as a varying sound level over the same time period.
- $L_{dn}$ (Day-Night Noise Level): The 24-hour $L_{eq}$ with a 10 dB "penalty" applied during nighttime noise-sensitive hours, 10:00 p.m. through 7:00 a.m. The $L_{dn}$ attempts to account for the fact that noise during this specific period of time is a potential source of disturbance with respect to normal sleeping hours.
- CNEL (Community Noise Equivalent Level): The CNEL is similar to the $L_{dn}$ described above, but with an additional 5 dB "penalty" for the noise-sensitive hours between 7:00 p.m. and 10:00 p.m., which are typically reserved for relaxation, conversation, reading, and television. If using the same 24-hour noise data, the CNEL is typically 0.5 dB higher than the $L_{dn}$.
- SEL (Sound Exposure Level): The SEL describes the cumulative exposure to sound energy over a stated period of time.

### EXISTING LAND USES SENSITIVE TO NOISE

The primary land uses adjacent to the levees and waterways included in the Phase 1 SERP coverage area are agricultural, urban, and open space. The largest urban center is the

Sacramento metropolitan area. Most of the coverage area is adjacent to agricultural uses. The noise environment comprises mobile (roadways and railroad tracks), stationary (industrial and commercial uses), and agricultural (seasonal) noise sources. Some airport uses are close to the coverage area, the largest being the Sacramento International Airport.

Land uses that are sensitive to noise generally include those uses for which exposure to noise would result in adverse effects and uses for which quiet is an essential element of the intended purpose. Residential dwellings near the individual project sites are of primary concern because individuals at these residences could be exposed to increased interior and exterior noise levels during short-term (1-4 weeks) small erosion repair construction projects. Existing off-site land uses that are sensitive to noise include single-family residences, places of worship, schools, and nursing homes that may be within the coverage area. These land uses could experience noise associated with construction, including increased haul-truck traffic and stationary sources (e.g., generators, compressors), as a result of the SERP.

## 3.7.4 Environmental Impacts and Mitigation Measures

### Thresholds of Significance

Based on Appendix G of the CEQA Guidelines, the SERP would result in a significant noise-related impact if it would:

- expose persons to or generate noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;
- expose persons to or generate excessive groundborne vibration or groundborne noise levels;
- result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project; or
- for a project located within an airport land use plan or, where such a plan has not been adopted, within 2 miles of a public airport or public use airport, or in the vicinity of a private airstrip, result in the project exposing people residing or working in the project area to excessive noise levels.

The first three significance thresholds above do not apply to the SERP. DWR is a State agency and, therefore, is not subject to compliance with local ordinances or policies; there would be no permanent increases in ambient noise levels; and excessive groundborne vibration would not be generated. The following threshold (evaluated in terms of $L_{eq}$ is used to assess noise

impacts related to a temporary or periodic increase in ambient noise levels attributable to the project, and is consistent with previously approved DWR projects, including the recently adopted CVFPP PEIR.

- Temporary, short-term construction noise impacts are considered significant if construction-generated noise levels would exceed 70 dBA at the location of sensitive receptors outside of normal construction hours (from 6 a.m. to 8 p.m., Monday through Friday, and from 7 a.m. to 8 p.m., Saturday and Sunday, and any additional period required by the nature of the project or due to unforeseen circumstances that necessitate work in process to be completed) , and/or construction noise during normal construction hours in the vicinity of sensitive receptors has not been reduced through feasible noise control measures.

### EFFECTS NOT EVALUATED FURTHER IN THIS DEIR

The SERP would not involve using any equipment or processes that would generate potentially high levels of ground vibration, such as pile drivers. Ground vibration generated during construction would be primarily associated with on-site truck activity, and sensitive receptors are not anticipated to be located near individual erosion repair sites. Therefore, the effects of vibration levels within the coverage area would be less than significant, and this issue is not evaluated further in this DEIR.

The SERP would not be expected to permanently affect environmental noise exposure in the Phase 1 SERP coverage area because of the short-term nature of individual erosion repair efforts. Therefore, implementation of the SERP would not result in a substantial permanent increase in ambient noise levels in the coverage area above levels existing without the SERP, and this issue is not evaluated further in this DEIR.

The SERP may include individual repair sites within 2 miles of an airport land use plan or near a public or private airport (see the discussion in Section VII, “Hazards and Hazardous Materials,” items [e] and [f] of Appendix A). The SERP would not involve developing new noise-sensitive receptors within 2 miles of an existing airport. Thus, the SERP would not be anticipated to expose people residing in the coverage area to excessive noise levels related to airports. Construction activities would be short-term (1 day to 1–4 weeks), heavy-duty construction equipment would be the dominant noise source to which workers would be exposed, and the SERP does not propose long-term work in areas within 2 miles of an airport land use plan or private air strip. Therefore, impacts relating to airport noise would be less than significant, and this issue is not evaluated further in this DEIR.

### ANALYSIS METHODOLOGY

To assess the potential temporary noise impacts from construction, sensitive receptors and their relative exposure were identified. Construction noise generated by activities at individual

project sites under the SERP is predicted using the *Federal Transit Noise and Vibration Impact Assessment* methodology for construction noise prediction (FTA 2006: 5-1 through 5-29 and 10-1 through 10-12). Emission noise levels and usage factors were referenced from the Federal Highway Administration Roadway Construction Noise Model Version 1.0 (FHWA RCNM V1.0) (FHWA 2006:3). Noise levels of specific construction equipment operated and resultant noise levels at sensitive receptor locations have been calculated.

Regarding traffic noise, AECOM conducted modeling based on haul-truck volumes as discussed in Section XV, "Transportation and Circulation," of the NOP/Initial Study (Appendix A). The FHWA Highway Traffic Noise Prediction Model (FHWA RD 77–108) (FHWA 1978) was used to calculate an individual project's noise levels from haul-truck traffic along affected roadways based on the sizes of project sites (Tier 1 or Tier 2 as described in the project description), haul truck size, and amount of hauling material. A project's noise levels from haul-truck traffic along haul routes are predicted at a reference distance of 50 feet from the roadway centerline.

### IMPACT ANALYSIS

**IMPACT 3.7-1** ***Increase in Temporary Noise Levels from Construction Activities.*** *Implementation of the SERP would result in temporary construction activities associated with small erosion repairs along levees within the Phase 1 SERP coverage area. These construction activities could expose sensitive receptors to a noticeable increase in ambient noise levels. This impact would be* ***potentially significant****.*

Construction noise levels near individual erosion sites would fluctuate depending on the particular type, number, and duration of usage of the varying equipment. The effects of construction noise largely depend on the type of construction activities occurring on any given day, noise levels generated by those activities, distances to noise-sensitive receptors, and the existing ambient noise environment near the receptor. Construction generally occurs in several discrete stages, with each stage requiring different equipment with varied noise characteristics. These stages alter the characteristics of the noise environment generated at each erosion site and in the surrounding area during the construction process.

Each small erosion repair, which would involve ground disturbance and aggregate material transport, would take from 1 day to 1–4 weeks to complete, depending on the size of the repair. Because the sites selected for construction each year may be located anywhere within the Phase 1 SERP coverage area, the individual repairs are treated here as temporary individual projects. No long-term construction or operational activities are proposed. On-site construction equipment used during site preparation would include excavators, dozers, backhoes, cranes, and trucks. Table 3.7-2 depicts the noise levels generated by the various types of construction equipment typically used during program implementation.

| Table 3.7-2<br>Noise Emission Levels from Construction Equipment | |
|---|---|
| **Equipment Type** | **Typical Noise Level (dB) @ 50 Feet** |
| Excavator | 85 |
| Crane | 85 |
| Dozer | 82 |
| Backhoe | 80 |
| Cement Mixer with Extended Arm | 85 |
| Truck | 74–81 |

Notes: dB = A-weighted decibels
Noise levels are for equipment fitted with properly maintained and operational noise control devices, per manufacturer specifications.
Source: Bolt, Beranek and Newman Inc. 1981, FTA 2006:12-6; data compiled by AECOM in 2009

As indicated in Table 3.7-2, noise levels for construction activities would range from 74 dB to 85 dB at a distance of 50 feet.[1] Continuous, combined noise levels generated by the simultaneous operation of the loudest pieces of construction equipment could result in a noise level of up to 89 dB at 50 feet. Accounting for the usage factor of individual pieces of equipment, topographical shielding, and ground absorption effects, construction activities at the erosion sites would be expected to result in hourly average noise levels of 80 dB $L_{eq}$ at a distance of 50 feet. Maximum noise levels generated by construction activities are not expected to exceed 85 dB $L_{max}$ at 50 feet from any given construction activity.

Noise from localized point sources (such as construction sites) typically decreases by 6–7.5 dB with each doubling of distance from source to receptor. Calculations to predict noise assume "soft" site conditions (i.e., sites with ground such as dirt, grass, or any vegetative cover that is not asphalt or concrete) with an attenuation rate of 7.5 dB per doubling of distance. To be conservative, no attenuation due to shielding from intervening structures (e.g., levees) is considered. Construction activities are predicted to generate exterior hourly noise levels of approximately 70 dB $L_{eq}$ at a distance of 200 feet, 62 dB $L_{eq}$ at 400 feet, and 55 dB $L_{eq}$ at 800 feet when propagated from the edge of the closest construction activity (Appendix E).

Based on the applicable short-term construction noise exposure criteria, project construction would be exempt from any noise exposure limit during established normal construction hours (i.e., 6 a.m. to 8 p.m., Monday through Friday; 7 a.m. to 8 p.m., Saturday and Sunday; and any additional period required by the nature of the project or due to unforeseen circumstances that necessitate work in process to be completed). Construction noise of 70 dB Hourly $L_{eq}$ or higher

[1] 50 feet is typically used as the standard distance of measurement for construction noise levels. Noise levels can then be adjusted to identify noise levels at a specific receptor, taking into account attenuation over distance and other factors.

at noise-sensitive uses, when measured outside of the established normal construction hours, would be considered a significant impact.

Although not planned, any construction activities occurring during evening and nighttime hours may be a nuisance and/or disrupt the sleep of the occupants of nearby residential dwellings. As a result, construction-generated noise would be considered a potentially significant temporary impact.

**Mitigation Measure 3.7-1: Implement Measures to Reduce Temporary Noise Levels from SERP Construction.**

DWR will implement the following measures during construction activities:

- DWR will require construction contractors, and/or DWR maintenance yard crews to properly maintain and equip construction equipment with noise controls, such as mufflers, in accordance with manufacturers' specifications.
- To the greatest extent feasible, construction outside of normal construction hours will be minimized or avoided completely when located in the vicinity of noise-sensitive receptors. Except under extreme circumstances (as in the case where a repair must be completed within a specific work window due to species or flood season requirements), construction activities will be limited to normal construction hours or hours identified in applicable local noise regulations.
- In locations where the erosion site would have a direct line of sight to sensitive receptors, on-site equipment and stockpiles will be strategically placed where feasible to block the line of sight (and thus the direct transmission of noise) from noise source to receptor.

With implementation of these mitigation measures, impacts associated with temporary noise levels from SERP construction would be reduced to a less-than-significant level.

**IMPACT 3.7-2** ***Increase in Temporary Noise Levels Related to Construction Traffic.*** *Implementation of the SERP could result in an increase of average daily vehicle trips in the Phase 1 SERP coverage area near erosion repair sites. The increased traffic volumes would likely not be sufficient to result in a significant increase in traffic noise along roadways within the Phase 1 SERP coverage area near erosion repair sites. This impact would be* ***less than significant****.*

Temporary construction activities under the SERP would increase average daily traffic (ADT) volumes on the local roadway network (i.e., additional haul trucks on the road) and, consequently, increase noise levels along the affected segments of the levee near erosion repair sites. The SERP would use barges to transport material to the individual erosion sites whenever this method is appropriate and feasible. If individual erosion sites require materials to be transported on the local roadway network, noise-sensitive receptors located near

affected roadways would experience increases in traffic noise levels. Noise levels attributable to haul trucks were modeled as shown in Table 3.7-3 using assumptions provided by DWR for typical haul material amounts, truck capacity, and type of project (Tier 1 or 2) (Eckman, pers. comm., 2009). Three conditions were modeled. The maximum truck volume condition assumed the maximum amount of material (3,900 cubic yards [cy]) would be delivered in 5 days (minimum time) using the 12 cy trucks (minimum truck volume). The average truck volume condition assumed the average amount of material (1,650 cy) would be delivered in 10 days (average time) using the 12 cy trucks (minimum truck volume). The minimum truck volume condition assumed the minimum amount of material (450 cy) would be delivered in 10 days (average time) using the 25 cy trucks (maximum truck volume). These three conditions along with varying speeds are presented in Table 3.7-3.

**Table 3.7-3**
**Modeled Traffic Noise from Haul Trucks**

| Condition | Total Material Needed (Cubic Yards) | CNEL at 50 feet | | | | |
|---|---|---|---|---|---|---|
| | | 25 mph | 35 mph | 45 mph | 55 mph | 65 mph |
| Maximum (65 trips per day) | 3,900 | 52.4 | 52.3 | 53.3 | 54.1 | 54.8 |
| Average (14 trips per day) | 1,650 | 45.8 | 45.6 | 46.6 | 47.4 | 48.1 |
| Minimum (2 trips per day) | 450 | 37.3 | 37.2 | 38.2 | 39.0 | 39.6 |

Notes: dB = A-weighted decibels; CNEL = Community Noise Equivalent Level; mph = miles per hour
Source: Eckman, pers. comm., 2009, adapted by AECOM in 2011

A quantitative evaluation of increased traffic noise levels along specific routes from haul trucks that would apply to a specific levee segment is not feasible at this time because the individual haul routes for each erosion site have not been identified. In addition, the additive noise contribution from haul-truck trips is expected to contribute nominally to existing levels of traffic noise because a doubling of traffic volume is required in order to increase traffic noise by 3 dB and the average truck traffic of 14 trips per day would be unlikely to double roadway traffic (Caltrans 1998: N-96). Also, haul trucks would be operating during identified normal construction hours or hours identified in applicable local noise regulations. As a result, traffic noise increases generated by project construction are expected to be less than significant.

No mitigation is required.

### 3.7.5 RESIDUAL IMPACTS

The implementation of the SERP would result in construction-generated noise that would have a potentially significant impact on sensitive receptors (Impact 3.7-1). However, this impact would be reduced to **less than significant** with implementation of Mitigation Measure 3.7-1. No significant and unavoidable impacts would occur.